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A Note on the Nesting Habits of the Roach-Hunting Wasp, Podium (Parapodium) carolina Rohwer (Hym).

By PHIL RAU, Kirkwood, Missouri.

In the spring of 1934 I gathered some nests of the mud-daubing wasp, *Sceliphron caementarium*, that had been used and resealed with a leaf-pulp by the bee, *Osmia cordata*. These nests were placed on a shelf in an open-faced shelter in my back yard with the hope of naturalizing the emerging *Osmia* bees. In June of the same year when I again inspected the mud nests, I found that the *cordata* bees had come and gone and that while most of the openings were plugged with a wad of leaf-paste, which is characteristic of *cordata*, four of them were plugged with a clear resin-like gum. My first thought was that the Osmias, being unable to find leaf-paste, had gathered this material from plants instead.

The four mud nests, each with a cell sealed in this unique manner, were placed in a large jar for observation. Nothing having emerged from them during the following twelve months, three of the four cells were opened on May 2, 1935, and I then found to my surprise, that each contained from one to three wood-roach nymphs about one-third grown. These were identified by Mr. Ashley B. Gurner as *Parcoblatta pensylvanica* (De Geer). Fortunately the fourth and unopened cell gave me an adult wasp a month later. This was identified by Miss Sandhouse as *Podium* (*Parapodium*) *carolina*.[1]

A closer examination of the nests shows that the roach-hunter is a gatherer of mud as well as of resin, for she makes mud partitions in the tube as well as mud plugs for the doorways. She later daubs the mud-plug as well as a small portion

[1] Miss Sandhouse writes that the specimen has been retained since it is only the second specimen which has been received since the species has been described by Mr. Rohwer.

of the surrounding territory with the resin. The emerging wasp has no difficulty in biting its way to freedom through this double layer. An examination shows also, that the mother wasp sweeps any rubbish such as old Osmia cocoons, spiders' webs and Dermestes' shedding-skins to the rear of the cell and entombs it by building a wall of mud. She prefers this method to that of laboriously carrying it out bit by bit.

The resinous substance became hard and slightly darker in color as the months slipped by, and I had often wondered where the wasps had obtained it. Recently Dr. Edgar S. Anderson of Missouri Botanical Garden, generously offered to examine the material microscopically. He reports that "Clear material of this sort might be nectar (not likely), a gum or resin. Gums and resins are often confused by biologists but they are two quite different substances, though they may exist in mixtures. Gums are water soluble, more or less, and they char when burned. Resins are insoluble in water and more or less soluble in alcohol, ether, etc. They burn with a bright flame. Gums come from the break down of plant tissues; resins are the secretions of special glands or ducts. The material daubed on the clay was insoluble in water, soluble in alcohol and burned with a clear bright flame, leaving no residue. When dissolved in alcohol the concentrate, examined under the microscope showed cells of a conifer (apparently a hard pine). It is a resin therefore, which the wasp probably found exuding from pine lumber nearby since no hard pines are found in your vicinity."

Here, then, we have a rare wasp, probably tropical in origin, working its way northward in the Mississippi Valley,[2] using roaches for prey as do most of the sister species of the genus, gathering mud for wall-partitions and doorway-plugs and then superimposing upon the doorway plug a plaster of resin which

[2] Williams, F. X. (Bull. Exp. Stat. Hawaiian Sug. Platn. Ass'n. *19;* 114, 1928) says "Cockroach wasps of the genera *Podium* and *Trigonopsis* inhabit tropical America although *Podium luctuosum rufipes* and *P. carolina* are known to occur in southern United States. They are mainly arboreal, although being mud-daubers are usually captured on the ground gathering nest material."

she has undoubtedly obtained from exudations on man-made lumber. This coating is probably for the purpose of making the nest water-proof but since the nest is built in the shelter of a building, one wonders from whence came the idea for the water-proof coating.

Are these habits in a transplanted species new, and are they in the process of being fixed into permanency, or are they vestiges from former times and other climes? This water-proof coating, small as it is, and useless as it is as a protective measure for weather and parasites, is undoubtedly a vestigial hang-over of former days when in the tropics the nests were arboreal and the coating was very necessary.

That enemies and weather are factors worthy of every protection in the tropics is brought out by Howes (Insect Behavior 1919, p. 33) who says that the roach-killer, *Podium rufipes,* is a solitary mason-wasp that has taken advantage of houses and buildings provided by man since it affords "safer quarters for her nest which originally she cemented to the concave sides of stumps of forests trees." He says further that when the nests are built in shutters of houses, and are conspicuous because they are made of an orange-red clay, it is a "regular habit of the wasp" to quickly cover her handiwork with neatly arranged layers of termites' wings, cast-off spiders' skins and other bits of refuse.

Through the observations of Williams also, we have a record of the nest building habits of several species of *Podium: Podium flavipenne* of British Guiana, (*loco citato* p. 118) is a cockroach hunter that digs a burrow in the ground two inches deep. She carries water in her mouth to soften the clay as she makes her excavations; and for *Podium haematogastrum* of Brazil, also a cockroach hunter, he says that several generations of this species nested in a large termite mound; and they also nest in burrows in banks and in level ground. Williams further mentions four species of Podium wasps (*P. goryanum, P. aureosericeum, P. brevicolle,* and *P. rufipes*) which are masons and build typical mud-daubing nests.

Thus we see that our own *Podium carolina* is not only unique

in using the abandoned cells of another insect since her sisters of various species are either excavators in the earth or builders of houses of masonry, but she is also unique in her sparing use of resin in a climate where the nests no longer need such protection.

Bibliography of Prof. George Hazen French.

By JOHN K. KARLOVIC, University of Chicago.

A search for the more important writings of Prof. French revealed the astonishingly large number of approximately 236 titles, pertaining to many branches of science. A large number of them are of popular interest and of an educational value to the farmer and truck gardener and were published in leading agricultural magazines and papers. Many of them are of a scientific nature and professional guidance to entomologists and men of research and were issued in extensive reports and journals. The more important publications of the latter kind may be cited as follows. A biographical notice of Prof. French (1841-1935) by the present writer was published in the NEWS for November, 1935.

* Lepidoptera. ** Preparatory Stages of. †Fungous diseases.

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Some New Species of Noctuidae. [*Dicopis vitis, Orthosia signata, Heliothis illinoiensis*]. Can. Ent., 11; 76-78.

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**Agrotis annexa, Tr. Can. Ent., 14: 207-210.

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**Epilachna borealis, Fab. Can. Ent., 15: 189-191.

1884 **Catocala amatrix, Hubn. Papilio, 4: 8-10.

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**Catocala ilia, Cram. Can. Ent., 16: 12-15.

1885 A New Pamphila [*myus*]. Can. Ent., 17: 33-34.

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Subdivision of Genera. Can. Ent., 22: 251-253.

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An Annotated List of the Ants of Arizona (Hymen.: Formicidae).

By A. C. Cole, Jr., Dept. of Entomology, Univ. of Tenn.

From the summits of Arizona's many heavily timbered mountains to the floors of her vast deserts and valleys is a wealth of insect life, including numberless ants. The variety of ant life is surpassed only by the number of teeming colonies of each species.

Much of the state is desert. Sandy, dry and unbroken soil lies in the north and a moister region occupies the centre. These areas are especially rich in ant species. In the desert the struggle for existence has been most severe and the survivors of past periods have well established and distributed themselves in a hostile environment. Certain habitat restrictions have limited the spread of many species, so that some of them are found in rather small and isolated areas. These

"pockets" are continually being discovered, and it is chiefly through the results of these "finds" that a sizable state list has been made possible.

I shall not attempt to discuss any ant extensively, or to annotate those species which have been collected by investigators other than myself. The notes appearing herein are original. Notes on ants which are merely listed have been heretofore published, and may be gleaned from the works of Wheeler, Smith, Olsen, Cole and others.

That this list is probably by no means complete has been foreseen and recognized by the writer. It may be considered merely a starting point to which additional data may be appended as time goes on. I have drawn freely from the publications of Drs. Wheeler, Smith and Olsen. To those who have made possible this contribution to the fauna of Arizona, I am gratefully indebted.

Subfamily PONERINAE.

1. STIGMATOMMA PALLIPES subsp. ARIZONENSE Wheeler. Huachuca Mts. (W. M. Mann).
2. PONERA OPACICEPS Mayr. Grand Canyon (Wheeler).
3. ODONTOMACHUS HAEMATODA subsp. DESERTORUM Wheeler. Tucson (Wheeler); Phoenix (Cole). A few workers of this interesting subspecies were running about at night in a grassy lot in Phoenix. The nest was not located.
4. O. HAEMATODA subsp. CONINODIS Wheeler. Huachuca Mts. (Wheeler, Mann).
5. O. CLARUS Roger. Huachuca Mts. (C. Schaeffer).

Subfamily DORYLINAE.

6. ECITON (ACAMATUS) OSLARI Wheeler. Nogales (Oslar).
7. E. (A.) ARIZONENSE Wheeler. Nogales (Oslar).
8. E. (A.) MEXICANUM (F. Smith). Nogales (Oslar).
9. E. (A.) HARRISI (Haldeman). Nogales (Oslar); Palmerlee (Schaeffer).

Subfamily MYRMICINAE.

11. PSEUDOMYRMA PALLIDA F. Smith. Huachuca Mts. (Schaeffer).
12. MYRMECINA GRAMINICOLA subsp. AMERICANA Emery. Grand Canyon (Wheeler).
13. M. GRAMINICOLA AMERICANA var. BREVISPINOSA Emery. Grand Canyon (Wheeler).

14. MONOMORIUM MINIMUM Buckley. Grand Canyon (Wheeler, Cole); Prescott (Wheeler); Jacobs Lake (Cole).

At Bright Angel Point on the south rim of the Grand Canyon, I found this species inhabiting small nests in the dark, rather dry porous soil beneath rocks. Winged castes were in the nests on July 20, 1931. The ground was deeply strewn with needles of *Pinus ponderosa*. Spruce, cedar and some Artemisia were present.

15. SOLENOPSIS AUREA subsp. AMBLYCHILA Wheeler. Huachuca Mts. (Wheeler).

16. S. HUACHUCANA Wheeler. Huachuca Mts. (Wheeler).

17. S. MOLESTA (Say). Flagstaff, Williams (Cole). The colonies were small and were all beneath flat stones.

18. S. MOLESTA var. VALIDIUSCULA Emery. Williams (Cole). One large colony was found beneath a rock in a yellow pine forest.

19. S. GEMINATA (Fabricius). Phoenix (Wheeler); Tucson (Fenner).

20. S. GEMINATA subsp. RUFA (Jerdon). Tempe (Wheeler).

21. S. XYLONI (McCook). Phoenix, Huachuca Mts., Oracle, Texas Pass (Wheeler); Kingman, Peach Springs, 16 Mi. S. of Prescott (Cole).

At Kingman and Peach Springs were small nests adjacent to fence posts in fine dry soil. Near Prescott the ants inhabited many small crater nests in a sandy arroyo. The colonies were large. Associated vegetation consisted chiefly of *Pinus ponderosa* seedlings, Opuntia and several grasses.

22. S. XYLONI var. MANIOSA (Wheeler). Yuma, Tempe, Yucca, Gila Bend Mts., Benson (Wheeler); Thatcher (R. V. Chamberlin); Tucson (Wheeler, Cole); Douglas (Cole).

A hole in the fine sand near Douglas marked the nest of a medium-sizel colony of this ant. Long files of workers extended to and from the nest opening. At Tucson one colony inhabited a nest beneath a flat rock in the dry desert.

23. S. XYLONI subsp. AUREA (Wheeler). Yuma, Grand Canyon, Phoenix, Casa Grande, Pinaleno Mts., Coyote Mts. (Wheeler).

24. S. XYLONI subsp. AMBLYCHILA (Wheeler). Huachuca Mts. (Wheeler).

25. PHEIDOLE CERES Wheeler. Grand Canyon (Wheeler).

26. P. KINGI subsp. TORPESCENS Wheeler. Tucson (Wheeler).

27. P. TEPICANA subsp. CAVIGENIS Wheeler. Huachuca Mts. (Wheeler).

28. P. FIMBRIATA Roger. Nogales (Oslar).

29. P. VIRAGO Wheeler. Tucson (Wheeler).

30. P. SPADONIA Wheeler. Tucson (Wheeler).

31. P. MILITICIDA Wheeler. Hereford (Wheeler, Mann); Benson (Wheeler).

32. P. VINELANDICA Forel. Grand Canyon (Wheeler); Tuba City, Douglas (Cole).

A few minute crater nests of this species were observed along a small stream at Navajo Springs, near Tuba City. The area was very rocky and protected by high cliffs on the east. Vegetation was abundant, and consisted chiefly of Opuntia, Yucca, grasses and Ephedra. The soil was moist near the stream but very dry elsewhere.

33. P. VINELANDICA subsp. BUCCALIS Wheeler. Ash Fork, Prescott (Wheeler).

34. P. VINELANDICA subsp. CEREBROSIOR Wheeler. Tucson (Wheeler).

35. P. VINELANDICA LONGULA var. CASTANEA Wheeler. Huachuca Mts. (Wheeler); Tuba City (Cole). Workers and soldiers of this variety were collected from a small nest beneath a rock at Navajo Springs, near Tuba City.

36. P. CALIFORNICA subsp. MICULA Wheeler. Huachuca Mts. (Wheeler).

37. P. CRASSICORNIS subsp. VALLICOLA Wheeler. Huachuca Mts. (Wheeler).

38. P. COCKERELLI Wheeler. Prescott (Cockerell, Wheeler); Tempe (F. H. Simmons).

39. P. DESERTORUM Wheeler. Ash Fork, Prescott, Grand Canyon (Wheeler); Phoenix, Tucson (Wheeler, Cole); Seligman, 40 Mi. S. Prescott (Cole).

A few workers were foraging in the desert near Seligman. South of Prescott I collected workers from a small crater mound of sand. At Phoenix and Tucson populous colonies were beneath stones on the sandy desert plains.

40. P. DESERTORUM var. MARICOPA Wheeler. Grand Canyon (Wheeler).

41. P. BARBATA Wheeler. 20 Mi. E. Needles, California (Cole). Three workers of *P. barbata* were found near a road east of Needles. The nest was not located.

42. P. XEROPHILA subsp. TUCSONICA Wheeler. Phoenix, Tucson, Douglas, 30 Mi. E. Kingman (Cole); Tucson (Wheeler).

43. P. XEROPHILA TUCSONICA var. GILVESCENS Wheeler. Phoenix, Tucson (Wheeler); Tucson (Cole).

44. P. PROSERPINA Wheeler. Tempe (Wheeler).

45. CREMATOGASTER LINEOLATA Say. Grand Canyon (Wheeler, Cole); Flagstaff (Cole).

46. C. LINEOLATA var. CERASI Fitch. Seligman (Cole).

47. C. LINEOLATA LAEVIUSCULA var. CLARA Mayr. Arizona (Emery); Kingman, Douglas (Cole).

48. C. LINEOLATA subsp. COARCTATA Mayr. Tucson (Wheeler).

49. C. ARIZONENSIS Wheeler. Tucson, Phoenix (Wheeler).

50. STENAMMA (APHAENOGASTER) *fulvum* var. TEXANUM Emery. Grand Canyon (Wheeler).

51. APHAENOGASTER TEXANA Emery. Grand Canyon (Wheeler).

52. A. TEXANA var. FURVESCENS Wheeler. Huachuca Mts. (Wheeler, W. M. Mann).

53. A. SUBTERRANEA subsp. OCCIDENTALIS Emery. Jacobs Lake (Cole).

54. NOVOMESSOR COCKERELLI (Ern. André). Benson, Santa Catalina Mts., Gila Bend Mts., Hereford, Oracle, Tempe, Yucca (Wheeler); Florence (C. D. Lebert); Huachuca Mts. (Biedermann); Tucson (Wheeler, Cole); Kingman, Prescott, Phoenix, Douglas (Cole).

55. N. ALBISETOSUS (Mayr). Pinaleno Mts., Texas Pass (Wheeler); Huachuca Mts. (Wheeler, Creighton); Bisbee (L. C. Murphree); Bonita (J. C. Bradley); Globe (H. C. Markman); Nogales (Oslar, Murphree); 55 Mi. S. Prescott, Phoenix (Cole); Baboquivari Mts., Coyote Mts.

The nests found by the writer were beneath flat rocks with small pebbles distributed around the entrances.

56. VEROMESSOR ANDREI (Mayr). Phoenix, 10 Mi. E. Needles, Calif. (Cole). The nests at both localities were of the usual crater mound type, each with a single large entrance surrounded by chaff.

57. V. PERGANDEI (Mayr). Nortons, Tempe, Casa Grande, Gila Bend Mts., Santa Catalina Mts., Yucca, Yuma (Wheeler); Ft. Mojada (J. Henderson); Tucson (Wheeler, G. von Krockow, E. A. Carpenter, N. C. Skinner, Cole); Phoenix (Cole).

The mound observed at Tucson was large and symmetrical, about 6 inches high and 18 inches in diameter, and in a very dry section of the desert. There was a large central opening at the bottom of each deep crater.

(To be continued.)

On Mounting Micro-Diptera.[1]

By CURTIS W. SABROSKY, Michigan State College.

The recent appearance of directions for collectors on mounting tiny insects has prompted the writer to call attention to what he regards as a far more desirable and practicable method. Detailed directions are given below for this method (fig. 1), together with a discussion of advantages and disadvantages of the common methods illustrated herewith.

In many groups, such as the small, hard-shelled Coleoptera and hard-bodied Hymenoptera (e.g., Chalcidoidea), the minuten nadeln are obviously not so practicable, but in Diptera and in small neuropteroid insects such as the Coniopterygidae, they may be used to considerable advantage. The Diptera, in particular, have fairly soft bodies and have body juices which are ample for attaching the specimens firmly to the pin.

The writer's experience as a collector and specialist in Micro-Diptera, and the experience of other dipterists such as R. H. Painter and F. M. Hull, have led to their adoption of the following as the neatest, most compact, and most desirable method of mounting small flies. It results in specimens in the best condition and in the most convenient position for manipulation during microscopic examination.

The general method is not entirely new, but the long established vertical manner of preparing minutens (fig. 2) seems to have prevented its popular adoption. Mr. Nathan Banks, in his excellent and comprehensive bulletin on "Directions for Collecting and Preserving Insects" (1909, U. S. Nat. Mus., Bul. 67, pp. 55, 56, fig. 98e), described it briefly and figured it along with other ways of mounting small insects.

The method may be summarized as follows:

1. *Take a thin sheet of good cork and cut it into small squares,* making them as uniform as possible in order to present a neat appearance. The cutting can be done rapidly with a razor blade mounted in a holder. The cork sheet is cut into

[1] Journal Article No. 268 (N. S.) from the Michigan Agricultural Experiment Station.

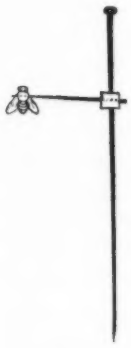


FIG. 1

FIG. 2

FIG. 3

FIG. 4

long strips, and the squares cut from these. Two or three strips may be used at a time, if one is careful to cut them off squarely.

As to the size of the pieces, a cork 3 mm. square and 1½ to 2 mm. thick has been found to present a neat, compact appearance in the collection without detracting attention from the specimens themselves. Smaller ones are good, just as long as they are adequate for holding the two pins. Larger ones can be used, but they appear bulky. Since the insects to be mounted are rather small, the size of the mounts should be kept within reasonable bounds, lest the result be a collection of cork pieces among which one must peer carefully to find the accompanying specimens.

2. *Push the large insect pin through the squares,* using a pinning block for uniform height. Either no. 2 or no. 3 pins are good; I prefer no. 3 because they do not buckle or snap back as do smaller sizes. (According to Banks, the minuten is first pushed through the cork, then into the insect, and finally the large pin is "inserted through the cork square." I believe that mounting will be expedited by taking the last step first.)

3. While holding the 'large pin plus cork' in one hand, *pick*

up a minuten with tweezers and push it through the cork square at right angles to the large pin (fig. 1). The blunt end of the minuten should project a bit, so that one can use tweezers and orient the insect to any desired position. The double mount is now ready for use.

It is hardly necessary to state that the angle, depth, etc., of the minuten nadeln are important not only in determining the appearance of the collection but also in facilitating examination under the microscope. The collection will also appear neater if one is careful always to place the minuten on the same side of the pin, either on the side towards him (preferred by the writer) or on the opposite side.

4. *Place the insect on its left side, and impale the specimen at the desired angle.* The head of the insect will then always be away from you in dorsal aspect, and the insect will be to the left of the main pin. These are the accepted positions. In order to insure a solid mount, press the insect gently against a thumb or finger until you feel the pin prick. The minuten will then project a slight distance through the specimen, but not enough to damage the pleura or increase the difficulty of determination.

Better mounts will result if the pinning is done under a binocular microscope, so that the minuten actually impales the insect. In most small Diptera, the *best plane of mounting* is probably the lateral one, with the minuten passing through the right and left pleura at or near the suture which separates mesopleura and pteropleura. Thus the entire dorsal aspect, the important mesonotal bristles and hairs, and the legs, are left undisturbed, and the left pleura is practically intact. In handling under the microscope, with the main pin horizontal to the base, the fly is seen in lateral aspect, which is probably the most advantageous for observing the principal characters. Furthermore, pinning through the pleura usually causes the wings to be extended, either horizontally or at a 45° angle, and this aids in the study of the wing venation. If a large series is available, several specimens may also be mounted in other planes.

From these detailed directions, the process may appear to be

too complicated for practical use. A very little practice, however, will enable one to cut the corks, pin, and insert the minutens fairly rapidly. Time is saved by concentrating on each step, and by cutting or pinning a large quantity before passing to the next step. For field work, a considerable number of completed mounts is made up in advance of the time when they will be needed.

Advantages and disadvantages of the various methods.

1. The principal advantage of the method outlined above (fig. 1) lies in the lessening of danger to the specimen. (By placing the labels *parallel* to the minuten, one may also give further protection). With the minuten perpendicular to the main pin, it is a simple and safe matter to rotate by twirling the head of the pin between two fingers, in order to examine the insect from various angles. The specimen is far enough from the head of the pin so that there is little or no danger of damaging it.

Regarding the objection that insects tend to flip off the minutens, it can be stated that there is far less trouble in this method than with points. There is practically no trouble if the minuten passes *through* the insect and not merely between the legs. The method possesses an added advantage for Diptera in that it does not require any affixing substances (shellac, glue, etc.), which may obscure important characters.

2. Insects mounted under the old minuten method (fig. 2) are difficult to handle with any degree of dispatch and safety. The position of the minuten results in the insect being placed near the head of the pin. If you are then removing or replacing specimens, with the head of the pin held between thumb and forefinger, there is great danger and likelihood of touching the insect on its precarious perch. Needless to say, one does not have to lean very hard against a fly only two to three millimeters long before something gives way.

If a person uses pinning forceps (which are not so necessary if one will only mount on a solid pin, such as a no. 3), the danger from handling is not as great. The poor specialist must then be pitied, for even if forceps are used to remove specimens from box or tray, he must still take hold of the pin with

his fingers in order to orient the specimen under the microscope. With the minuten parallel to the large pin, and with the tiny insect consequently so near to the thumb and finger hold, such orientation too often produces dire results. In olden times, this method might have been called the guillotine.

3. For best results, micro-Diptera should not be mounted in any way which requires the use of a gluing medium. Such materials all too frequently mess up the important bristles, hairs, pollen, or scales, and render the specimen practically worthless and next to impossible to identify with any degree of certainty. Cresson (1913, ENT. NEWS, 24, pp. 8-12) ably states the objections to the gluing method, and emphasizes the fact that such media often cause the fly to become greasy and discolored, and thus multiply the difficulties of determination.

Of the various methods of gluing now in use, the point method (fig. 3) is the least objectionable, and indeed is to be preferred to the old minuten method. Points possess the same advantages of ease and safety in manipulation that are found in the minuten method proposed in this paper. Furthermore, if the amount of glue is reasonable and the insect is not almost submerged, the various aspects of the fly can be examined without much trouble.

The tendency to flip off, which is a serious objection, is far more pronounced with points than with minutens. In order to mount rapidly on points, one usually tips several in glue before attaching the insects. A surface film forms quickly on most of the mounting media now in use. The result is that specimens often appear to be firmly affixed, whereas they are really adhering very slightly. The point then becomes an admirable springboard from which the insect may be propelled with the greatest of ease.

4. The most objectionable method of mounting, in my opinion, is that in which the insect is stuck directly to the main pin, without a secondary mount (fig. 4). This method possesses the undesirable features of the other methods, to say nothing of necessitating a game of hide-and-seek around the pin. The

large pin, plus the amount of glue necessary to attach the specimen, often obscures from one-half to three-fourths of the insect, besides greatly increasing the danger from discoloration. If a smaller pin is used, it is objectionably slender and more difficult to handle.

Of all the methods, the writer wishes especially to urge the adoption of the double mount with the minuten nadeln perpendicular to the main pin. It has the most advantages and the least objections of any of the methods. The student who adopts the mount will feel amply repaid by the fine condition of his material, either for display or for study.

The Use of the Headlight in Collecting Nocturnal Spiders.

By Howard K. Wallace

The use of lights in night collecting and field observations has no doubt furnished much valuable material and data for biological investigations. Because of its adaptation to certain types of problems I feel certain that the method must have been used by many biologists, though how extensively I have no means of knowing. However, competent and experienced investigators from several parts of the country, who have recently accompanied me on field trips, have expressed surprise and enthusiasm at the results obtained by the use of the headlight in night collecting. It is the purpose of this article to bring certain aspects of the use of the headlight [1] to the attention of interested persons.

For some years it has been the custom of graduate and undergraduate students connected with the Department of Biology of the University of Florida to make frequent excursions into the field at night with headlights, and these trips have done much to arouse in them an interest along various lines of biological research. Several years ago the author became interested in spiders and began making a collection of Florida material.

[1] The Winchester three-cell, focusing type, is the light most generally used, and considered most satisfactory, among my acquaintances.

Someone suggested the possibility of illuminating the eyes as a means to collecting and this suggestion was followed out with gratifying results. In fact the excellency of this method led to the development of a special interest in one family of spiders, the Lycosidae. The eyes of all the members of this family that I have encountered shine brilliantly, sparkling green, red, or yellow, and in at least some parts of the country collecting, ordinarily, is a simple matter. The spider, blinded by the shaft of light, apparently is not disturbed by the presence of the collector and as a rule remains motionless and is easily taken with forceps. Furthermore, every lycosid spider within reach of the headlight, whose eyes are accessible to the light rays, can be spotted. The reflections from the minute eyes of some of the smaller species, such as Arctosans and Piratans, are difficult to detect but they *can* be collected in this manner. Other species seem to be highly sensitive to vibrations set up in the ground or weeds and bushes by the approach of the collector and drop into their burrows or retreat into inaccessible tangles of vegetation. These, like *Lycosa carrana* Bryant, and *Lycosa watsoni* Gertsch, are difficult to catch and I find it much more profitable to collect for them at night.

The value of the light is well brought out by the following experience: one afternoon a strip of black, mucky beach, about one hundred yards long and thirty yards wide, on the edge of a lake and almost devoid of vegetation of any kind, was collected over carefully for fully ninety minutes. Two Lycosids were seen and taken. This same area was collected with a headlight about on hour after sunset on the evening of the same day. Literally thousands of eyes could be seen and specimens were collected as fast as I could go through the motions of picking them up and dropping them into a bottle. In this connection it is worth noting that almost all, if not all, of the members of the family Lycosidae in Florida are nocturnal in habit.

Interestingly enough, collectors from the East and Northwest report much poorer results with the headlamp and this was borne out in part by my experiences during the past summer. I found spiders in abundance along the Atlantic coastal

plain and piedmont regions as far north as Virginia and in goodly numbers in Indiana, but in the mountains of North Carolina, Virginia, and Pennsylvania the results of night-collecting were poor. The scarcity of spiders encountered might be attributed to several factors—a much less populous fauna, adverse weather conditions, or predominance of diurnal habits. T. H. Hubbell reports spider eyes just as abundant, on one occasion, on the shore and in the adjacent pine woods around Higgin's Lake, Michigan, as he has ever seen them in Florida. Also, that he observed many spider eyes in western Texas and Arizona during the past summer. It appears that an accurate estimation of the value of night-collecting for any particular region, at least for spiders, awaits the headlight exploration of a wider variety of environments and geographical regions.

Lycosids are not the only spiders easily collected and observed at night. The eyes of species in the families Pisauridae, Thomisidae, and Ctenidae have been illuminated and web-spinning individuals may be located by lighting up their webs. Small species living in leaf mould, other decaying organic matter, under rocks, under stones, etc., are easily spotted when they begin to move about after their hiding-places have been disturbed. Blinded by the shaft of light, or perhaps due to a retardation of their physiological activities brought on by environmental conditions obtaining during the night, they do not move about as actively or find other hiding-places as readily as they do in daylight.

The following is a partial list of the uses of the headlight as put into practice by my associates or acquaintances:

Mr. A. F. Carr, Jr., herpetologist, uses the headlight extensively for collecting purposes and also for making field observations. He finds it especially productive in the matter of collecting frogs, both large and small, particularly when they are concentrated in or near water during the breeding season. The eyes of some can be illuminated while the smaller individuals can be located by their calls or songs and approached within arm's length while blinded. The fact that the beam of light directs attention to a limited area helps in detecting their form

or movement. Snakes, turtles, salamanders and lizards are also readily taken while blinded. Mr. Carr also recommends the use of the headlight for making observations on the breeding habits of fish, which, in many instances, are not so disturbed by the light as they are by shadows during the day. He suggests that this is an excellent way of observing reef fishes, squids, and other marine forms which cannot be approached before sunset. The same applies in general to the bottom fauna of bodies of fresh water.

Professor T. H. Hubbell has contributed the following information concerning the Orthoptera: Although it is not possible to illuminate their eyes, night collecting in general is very useful. Many orthops move about at night whereas they are quiescent during the day. The headlight is used because of its convenience. It focuses attention on a small area, makes it possible to keep moving forms in view by simply turning the head, and leaves both hands free for the manipulation of collecting apparatus. A great many diurnal orthops living on the ground, in grasses, bushes and the like, under certain meteorological conditions climb to the tops of weeds and grasses to sleep, are detectable from a distance, and can be picked off with ease. These include many swift-flying forms. Others can be roughly located at night by their songs and by moving up carefully, stopping and turning off the light when they cease singing until they resume their songs, can be approached close enough for collection. Sometimes this procedure requires a great deal of patience but their songs can be learned in this manner and subsequent records made without actually taking the specimens. Mr. B. B. Fulton of North Carolina State University and Mr. E. S. Thomas of the Ohio State Museum are particularly successful practitioners of this method. Many Orthoptera live in trees and are seldom seen on the ground. The first clue to their whereabouts is usually furnished by their songs and after that it is often possible to locate them with a spot-light and subsequently knock them out of the tree with a .22 rifle loaded with dust shot. Giant katydids have been shot out of the tops of oak trees in this manner. Some grasshoppers with specific

food plants spend the day concealed within the interior of the bush and come out at night to feed. The advantage of the light in this case is demonstrated in one instance wherein Hubbell and Walker, collecting *Schistocerca ceratiola,* caught eleven hundred specimens at night and only twelve during the day. One unusual night's work in South Florida yielded two thousand specimens of miscellaneous Orthoptera, found asleep on plants.

Many other insects and representatives of other groups may be collected using various applications of the headlight method. The eyes of moths and crayfish glow very similarly with a soft, red luminescence. Beetles, ants, Dermaptera, dragonflies, antlions and many other forms have been taken at night.

In the opinion of several of my associates as well as myself, such routine collecting methods as turning over logs and stones, sifting leaf mould, tearing open rotten logs, looking under loosened bark on dead trees, sweeping and beating, often yield better results at night with a headlight, especially in regard to particular forms. It has also been suggested as a means of observing breeding, feeding, and other activities of many nocturnal animals.

A New Leptinopterus from Brazil (Coleoptera: Lucanidae).

By Bernard Benesh, North Chicago, Illinois.

The subjoined short diagnosis of a member of the South American genus *Leptinopterus,* describes an insect apparently new to science; it was recently received through the kindness of Dr. E. Franz of the Senckenberg Museum, Frankfurt a/M., Germany. The insect was labelled *Psalidostomus vestitus* Burmeister,[1] the specific name being retained for designation of this interesting stag-beetle.

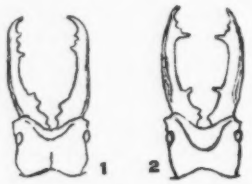
Leptinopterus vestitus (Burmeister Ms.?) n. sp.

This species is a close relative of *L. gracilipes* Didier,[2] from which it can readily be distinguished by its slender body and vestiture.

[1] Burmeister proposed the name in his Handbuch der Entomologie 1847, volume V, page 377; the generic name is preoccupied, being used for a South American genus of Prioninæ.

[2] Didier, Etudes sur les Coléoptères Lucanides 1928, p. 80.

Head nearly quadrate, broadest in front, tapering to base, frontally depressed, convex towards the occiput (in *gracilipes* with a distinct longitudinal sulcus), finely granulate, dark castaneous. Antennæ piceous, shining, 8th, 9th and 10th joint forming the clava, latter entirely spongy. *Mandibles* asymmetrical, massive, canaliculate on top, rounded laterally, porrect, slightly curved from basal third to apex, apex diagonal with three teeth, posterior the longest and pointing directly inward; basally left mandible with a strong, bifid tooth, right with an obtuse conical tooth, and anterior to these another small tooth.



1. *L. gracilipes* After Planet Didier

2. *L. vestitus* n. sp.

Thorax broader than long, darker than the head, minutely punctate, covered sparsely with golden pile, anteriorly bisinuate and densely fringed with long golden hairs, sides gently narrowing to base, posterior angles diagonal, base nearly straight; disk glabrous, with a feeble longitudinal depression. *Elytra* gradually tapering to apex, of much paler color than the head, finely punctulate, clothed with golden pile, obliterated in the scutellar area, becoming much more dense toward the lateral margins. Scutellum rounded (in *gracilipes* it appears to be heart-shaped), nearly invisible, being densely covered by long, prostrate, golden hairs.

Ventrally, mandibles black from the basal third to apex, cherry-red at base, mouth parts and gula blood-red, becoming much darker on the genæ; prosternum deep castaneous, meso- and metasternum and abdomen black, shining. *Legs* very slender, intermediate and posterior entirely black; anterior tibiæ deep castaneous, armed externally with three strong spines, distal longest; femora black; tarsi black.

Principal measurements: overall length (mandibles included) 24.5 mm; mandibles 8.5 mm; head 6.5 mm wide; prothorax 6.25 mm wide and 3.5 mm long; elytra 6 mm wide and 9 mm long.

Habitat:—Brazil; Minas Geraes—Passa Quatro.

Type a unique ♂, in the author's collection, accession number 3165. The female is unknown.

ENTOMOLOGICAL NEWS

PHILADELPHIA, PA., APRIL, 1937.

ENTOMOLOGY AT THE CONVOCATION WEEK MEETINGS, DECEMBER 28, 1936, TO JANUARY 2, 1937.

Our annual summary of the entomological items of the programs of the American Association for the Advancement of Science and Associated Societies, held at Atlantic City, New Jersey, follows.

The number of papers bearing on insects, including those in symposia and non-duplicating demonstrations, were:

Entomological Society of America	44
American Association of Economic Entomologists	94
*American Society of Zoologists	29
*American Society of Parasitologists	8
Mycological Society of America	2
American Society of Naturalists	1
Ecological Society of America	1
*Genetics Society of America	16
Limnological Society of America	2
American Society of Horticultural Science	1
*Potato Association of America	8
Total	206

These papers were distributed in subject as follows:

i		Geographical Distribution	4
*General Entomology	8	*Genetics	8
Collecting and Rearing Methods	3	Evolution	1
Entomological Instruction	2	Taxonomy	5
*Cytology	12	Parasites and Diseases of Insects	5
Embryology and Life History	9	*General Economic Entomology	14
Anatomy and Morphology	3	*Insecticides	27
*Physiology	33	*Apiculture	13
Ecology	8	*Arthropods Affecting Man	13
Behavior	1	*Do. do. other Animals	7

Do. do. Cereals and Field Crops	18
Do. do. Truck Crops	10
*Do. do. Households	3
*Do. do. Ornamental and Greenhouse Plants	3
Do. do. Fruits and Fruit Trees	8
*Do. do. Forest and Shade Trees	3
Do. do. Miscellaneous Plants	4
ii	
*Acarina	6
Orthoptera	19
Isoptera	1
Ephemerida	1
Odonata	1
*Homoptera	17
Heteroptera	4
Anoplura	1
*Thysanoptera	4
Coleoptera (excluding Japanese Beetle)	19
Japanese Beetle	1
*Hymenoptera (excluding Honey Bee)	12
* Honey Bee	7
Trichoptera	1
Lepidoptera (excluding the three following)	10
Codling Moth	6
Oriental Fruit Moth	1
Corn Borer	3
*Diptera (excluding *Drosophila*)	20
* *Drosophila*)	16
Siphonaptera	1

Many of these figures are duplications, both between sections i and ii and also within sections. Increases in numbers of papers over the corresponding figures for 1935-36 are starred (*). Decreases are not indicated; in some subjects they are considerable. The total number of papers, 206, is below those for 1935-36 and 1934-35 (239 for each year).

Both entomological societies met in Haddon Hall, their meeting rooms being at opposite ends of the same hall. The Entomological Society was presided over by Prof. H. B. Hungerford, University of Kansas; the Secretary was Prof. C. E. Mickel, University of Minnesota. The annual address was given by Dr. Edith M. Patch, University of Maine, on "Without Benefit of Insects," at the combined Entomologists' dinner, December 29, at 6 P. M.

The President of the Economic Entomologists was Mr. Leonard S. McLaine, of the Department of Agriculture, Ottawa, and the Secretary, Prof. E. N. Cory, University of Maryland.

A joint symposium of the two societies on Insects Affecting Man was held on December 28. To the great joy of all entomologists, it was presided over by Dr. L. O. Howard, who also occupied the seat of honor at the Entomologists' dinner.

Entomologists were represented also in the symposium of the Ecological Society on Experimental Populations, December 29, and in that of many societies on Supra-specific Variation in Nature and in Classification, on December 31.

Entomological Literature

COMPILED BY V. S. L. PATE, LAURA S. MACKEY and E. T. CRESSON, Jr.

Under the above head it is intended to note papers received at the Academy of Natural Sciences, of Philadelphia, pertaining to the Entomology of the Americas (North and South), including Arachnida and Myriopoda. Articles irrelevant to American entomology will not be noted; but contributions to anatomy, physiology and embryology of insects, however, whether relating to American or exotic species will be recorded.

The figures within brackets [ ] refer to the journal in which the paper appeared, as numbered in the list of Periodicals and Serials published in our January and June issues. This list may be secured from the publisher of ENTOMOLOGICAL NEWS for 10c. The number of, or annual volume, and in some cases the part, heft, &c. the latter within ( ) follows; then the pagination follows the colon :

All continued papers, with few exceptions, are recorded only at their first installments.

(*) Papers containing new forms or names not so stated in titles, have an * within parentheses thus (*) following the pagination of reference to paper.

(S) Papers pertaining exclusively to neotropical species, and not so indicated in the title, have the symbol (S) at the end of the title of the paper.

For records of Economic Literature, see the Experiment Station Record, Office of Experiment Stations, Washington. Also Review of Applied Entomology, Series A, London. For records of papers on Medical Entomology, see Review of Applied Entomology, Series B.

Note. Titles of papers containing new forms or new names will be indicated by an asterisk within parentheses at end of reference, (*).

Papers published in the Entomological News are not listed.

GENERAL.—Anon.—The venus flytrap in action. [Nat. Mag.] 29: 154-155, ill. **Brownell, L. W.**—Some American insect galls. [Nat. Mag.] 29: 159-161, ill. **Claassen, P. W.**—On preparing specimens for determination. [Ward's Ent. Bull.] 4: 1-2. **Curran, C. H.**—Insect lore of the Aztecs. [Nat. Hist., N. Y.] 39: 196-203, ill. **Johnson, H. A.**—Attractivity of light for Anopheles mosquitoes. [Jour. Tenn. Acad. Sci.] 12: 104-106, ill. **Kemner, N. A.**—Det femte Nordiska Entomologimotet i Lund 3-6 augusti 1936. [Opuscula Entomologica] 1: 65-101. **McDunnough, J. H.**—Directions for collecting and preserving insects. [Dom. Canada, Dept. Agr.] Circ. 110: 14pp., ill. **Passmore, L.**—The tarantula builds her eggsac. [Nat. Mag.] 29: 166-167, ill. **Plaumann, F.**—Im Urwald. [17] 54: 213-216. **Rosa, A. F.**—The influence of bird migration upon the distribution of mimetic species of Lepidoptera. [9] 70: 32-37, ill.

ANATOMY, PHYSIOLOGY, ETC.—Abbott, C. E.—The physiology of insect senses. [70] 16: 225-280, ill. **Agrell, I.**—Der Sexualdimorphismus der ausseren Genitalien bei den Collembolen, nebst Bemerkungen uber Verschiedenheiten in Grosse und Frequenz der Geschlechter bei denselben. [Opus. Entom., Lund] 1: 119-127, ill. **Auel, H.**—Einfluss der Witterungselemente auf die Grosse von Pieris brassicae (Lepid.). [65] 23: 596-602. **Auerbach, C.**

—The development of the legs, wings, and halteres in wild type and some mutant strains of Drosophila melanogaster. [Trans. Ry. Soc. Edinb.] 58: 787-816, ill. **Clancy & Beadle.**—Ovary transplants in Drosophila melanogaster: Studies of the characters singed, fused and female-sterile. [92] 72: 47-56. **Cooper, K. W.**—Reproductive behaviour and haploid parthenogenesis in the grass mite, Pediculopsis graminum (Acarina, Tarsonemidae). [Proc. Nat. Acad. Sci.] 23: 41-44, ill. **Dethier, V. G.**—Gustation & olfaction in Lepidopterous larvae. [92] 72: 7-23, ill. **Dreyer, T. F.**—Wing abnormality in Locustana pardalina. [Nature] 139: 197, ill. **Fortner, G.**—Zur Ernahrungsfrage der Simuliumlarve. [46] 32: 360-383, ill. **v. Frankenberg, G.**—Die "Selbstsamputation" der Eintagsfliegen. [46] 32: 384-390, ill. **Hohorst, W.**—Die Begattungsbiologie der Grille Oecanthus pellucens. [46] 32: 227-275, ill. **Hoppe, E.**—Untersuchungen uber die Vitalitat zweier Stamme von Habrobracon juglandis unter verschiedenen Bedingungen. [65] 23: 559-577. **Johnson, H. A.**—Attractivity of light for Anopheles mosquitoes. [J. Tenn. Acad. Sci.] 12: 104-106, ill. **Krawany, H.**—Die metamorphose von Leptocerus alboguttatus, Synagapetus armatus und Rhyacophila horticornis. [Internationale Revue] 34: 1-14, ill. **Marsh, F. L.**—Ecological observations upon the enemies of Cecropia, with particular reference to its Hymenopterous parasites. [84] 18: 106-112. **Profft, J.**—Beitrage zur Symbiose der Aphiden und Psylliden. [46] 32: 289-326, ill. **Schuch, K.**—Beitrage zur Ernahrungsphysiologie der Larve des Hausbockkafers (Hylotrupes bajulus). [65] 23: 547-558, ill. **Schulze, P.**—Trilobita, Xiphosura, Acarina. Eine morphologische untersuchungen uber plangleichkeit zwischen Trilobiten und Spinnentiere. [46] 32: 181-226, ill. **Seidel, F.**—Entwicklungs physiologie. Arthropoda. [Fortschr. Zool.] 1: 413-421, ill. **Steiner, P.**—Beitrag zur Fortpflanzsbiologie und Morphologie des genitalapparates von Boreus hiemalis. [46] 32: 276-288, ill. Hausbockuntersuchungen. (1 Mittl.) Uber den Einfluss von Temperatur und Feuchtigkeit auf das Eistadium und Bemerkungen zur Biologie der Imago. [65] 23: 531-546, ill. **Thalenhorst, W.**—Versuche uber die Wirkung von Kontaktstaubemitteln auf Pieris brassicae unter besonderer Berucksichtigung der Abhangigkeit von biotischen und abictischen Faktorten. (Zugleich ein Versuch zur Ausgestaltung der Prufungsmethodik.) [65] 23: 615-652, ill. **Weber, H.**—Morphologie und entwicklungs-

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SPECIAL NOTICES.—Beller & Bhenchitr.—Preliminary list of insect pests and their host plants in Siam. (With notes on their injury, miscellaneous foods and utilization of the host plants.) [Dept. Agr. & Fish., Bangkok, Siam, Tech. Bull.] No. 1, 68 pp.

Journal of the Federated Malay States Museum, Vol. XVIII, Part 1. This is a volume of 212 pages, containing articles on many groups of insects. Its publication is due to the indefatigable zeal of Mr. H. M. Pendlebury, of the Selangor Museum at Kuala Lumpur, an admirable institution which I had the pleasure of visiting in 1928. An American entomologist might think that these articles, on the fauna of a region so remote, had little interest for him, but there is much that is of general interest. I select a few items:

(1) Kimmins, of the British Museum, reports on the Odonata collected by the Oxford University Sarawak Expedition, and takes occasion to list the species known from Borneo. There are 213, of which about 45% are known only from that island. But of the Libellulidae only about 9.5% are apparently endemic, whereas all the Cordulegasteridae and Platystictidae appear to be endemic.

(2) Kleine, of Stettin, gives an account of a collection of beetles of the families Brenthidae and Lycidae. He remarks on the existence of a whole series of Lycidae, of diverse genera, and also a few Brenthidae, which occur in the mountains, and distinguished by their black color. The lowland species are variegated.

(3) Corbet and Pendlebury have a very interesting article

on the butterflies of the genus *Amathusia*. They think that certain species of this genus may be quite distinct in one region, yet intergrade in another, and state that there is an undoubted case in *Neptis: N. nandina* and *yerburyii* are abundantly distinct in Burma and the Malay Peninsula "and yet in Java the two are connected by intergrades and constitute a single species." May we not presume that in the former case there is some physiological barrier to crossing, which has been broken down in the latter There is one minor criticism which may be made. The authors describe a new species as *Amathusia holman hunti*. As they write it one might infer that *hunti* was a subspecies of *holman*. The name is not a binomial, nor is it a trinomial. It should surely be written *A. holman-hunti*.

T. D. A. COCKERELL.

A Record of Vespa crabro Linnaeus from North Dakota (Hymenoptera: Vespidae).[1]

The writer recently had an opportunity to examine a single male specimen of *Vespa crabro* Linnaeus collected at Tioge, North Dakota about the middle of September, 1933, by D. Elmo Hardy. A record of this interesting European species so far west should be of considerable interest to hymenopterists since it has been formerly known definitely only from a limited area in the far eastern states. Published records from Chicago and other parts of Illinois are, according to Dr. Bequaert (Entomologica Americana, Vol. XII, No. 2, p. 86, 1931), not based upon specimens but upon information which is not considered entirely reliable. According to this same writer the species has been recorded authentically only from parts of the states of New York, New Jersey, Connecticut, Pennsylvania, Delaware, and Maryland.

Mr. Hardy, who collected the specimen referred to above, states that the insect was found flying low over an open field and that no other specimens were seen. Whether the species is permanently established in North Dakota or has been merely accidentally brought into the state may be determined only by future collecting in that region. C. LYNN HAYWARD.

[1] Contribution No. 67, Department of Zoology and Entomology, Brigham Young University, Provo, Utah.

EXCHANGES

This column is intended only for wants and exchanges, not for advertisements of goods for sale or services rendered. Notices not exceeding three lines free to subscribers.

These notices are continued as long as our limited space will allow; the new ones are added at the end of the column, and, only when necessary those at the top (being longest in) are discontinued.

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